

The Implementation of Visual Thinking Approach in Learning Activity with a Quick on the Draw to Improve the Problem Solving Ability of Junior High School Students

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Abstract

This study is based on low ability in problem solving students'. In order to overcome the problem, the study is done using Visual Thinking approach in learning activity with a Quick on the Draw activity. This study examines the problem of improvement in problem solving among students who receive Visual Thinking learning approach with the quick on the draw activity and conventional learning approach which reviews whole students and students' mathematical prior knowledge (high, medium, and low).

This is a quasi-experimental design with nonequivalent control group design and uses purposive sampling technique. Population in this study was VIII grade students of SMP in city of Pekanbaru, Riau year 2012/2013. Furthermore, the sample of this study was VIII grade students in a SMP of city of Pekanbaru, Riau. Instrument in this study was a test of problem solving ability, attitude scale, observation sheet of teacher' and students' activities. Quantitative analysis was performed using the average difference test.

The result of the study showed that: (1) The increase in students' ability of mathematical problem solving whereas the students received Visual Thinking approach in learning activity with the Quick on the Draw activity is better in comparison with conventional learning approach which reviews whole students and students' mathematical prior knowledge (high, medium, and low).

Key words : *Visual Thinking approach in learning activity, a Quick on the Draw activity, ability in mathematical problem solving.*

A. INTRODUCTION

1. Background

The importance of learning mathematics as part of the educational process has been stated in the Education Unit Level Curriculum (SBC). Ministry of Education (2006: 345) states that the mathematics courses should be offered to all learners ranging from elementary school to equip students with the ability to think logically, analytical, systematic, critical, and creative, as well as the ability to cooperate. Competence is required so that learners can have the ability to acquire, manage, and utilize the information to survive in the ever-changing circumstances, and certainly not competitive.

This is in line with what was raised by Sabandar (2008), in which the learning of mathematics in schools is not only intended to make students understand the material being taught mathematics, but the other main objectives, namely that students have the ability to mathematical reasoning, mathematical communication, mathematical connections, representations of mathematics and mathematical problem solving, as well as certain behaviors that students should get after he studied mathematics.

Among the capabilities presented by Sabandar above, the ability of mathematical problem solving and communication are two skills that are needed by

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every person in the face of life, especially in the era of globalization and information such as this. The ability of mathematical problem solving and communication are two skills that have been stated in writing in the eyes of the purpose of learning mathematics in primary and secondary education listed in the Education Unit Level Curriculum (SBC) SBC 2006 suggests that the students have the ability to: (1) Understanding mathematical concepts, explains the relationship between concepts and apply the concepts or logarithmic, flexibly, accurately, efficiently, and accurately in solving problems; (2) Using the pattern and nature of reasoning, mathematical manipulation in making generalizations, compile evidence, or explain mathematical ideas and statements; (3) Solve problems that include the ability to understand the problem, devised a mathematical model, solve the model and interpret the obtained solution; (4) Communicate ideas with symbols, tables, diagrams, or the media to clarify the situation or problem; (5) Have respect for the usefulness of mathematics in life, namely to have curiosity, attention, and interest in studying math, and tenacious attitude and confidence in solving problems.

Based on the above explanation, the problem-solving ability is an ability that is very important and a major focus for developed and owned by the student through the learning of mathematics in schools.

Wahyudin (2008: 520) states that problem solving is an integral part of all mathematics learning. The importance of mathematical problem solving ability to be owned by the students also expressed by Sumarmo (1993), the ownership of the problem solving ability of students is important, because the problem-solving ability is the goal of teaching mathematics, even as the heart of mathematics. In connection with the importance of problem solving skills, Sumarmo (2010) stated that the essential problem-solving skills, because troubleshooting memalui students can (1) identify the adequacy of the data for problem solving; (2) create a mathematical model of a situation or everyday problems and solve them; (3) select and apply strategies to solve math problems and or outside mathematics; (4) explain and interpret the results as the origin of the problem, and verify the results or answers; (5) apply mathematics meaningfully.

The reality on the ground shows that the mathematical problem-solving ability of students is still low. Sumarmo study (1993) showed that the level of formal thinking students are yet to develop optimally, and problem-solving ability is low. Similarly, Wardani (2002) stated that in the classical, mathematical problem-solving ability of students have not reached a level of mastery learning. Further research conducted by Garofalo and Lester (Wahyudin, 2008) states that the lack of mathematical knowledge is not caused by failures in solving the problem, but is not effective in utilizing the knowledge that has been owned by a previous student. In this case, students have mathematical knowledge, just not careful and skilled in the use of such knowledge. Based on some research findings above, it is very important problem solving skills to be developed. Some descriptions above indicate that the ability of solving mathematical problems need to be improved, because the ability is the ability to be possessed by the student to the needs of the present and future needs

Current conditions in the field, generally indicates that the learning activity is still dominated by the teacher, the student still has not played an active role in learning. Ruseffendi (1991) states that mathematics is given in schools mostly obtained through

notification by the teacher, thus making students become passive. Students simply repeating the algorithm and the procedure described by teachers in working on routine (drill). Such learning model according to Brooks and Brooks (Hutapea, 2013) called the conventional learning. Therefore, it seems necessary held application of modern learning in the learning of mathematics, as less conventional learning can develop high-level thinking skills.

One variation of learning that can be done by the teacher to overcome the difficulties in solving problems and help students process mathematical communication is learning the Visual Thinking approach. Visual thinking (Visual Thinking) can be an alternative to facilitate students in learning mathematics. This is in line with what was raised by Surya (2011: 194) which states that students typically have difficulty bridging the informal knowledge of mathematics to school. Students need guidance and assistance in the form of a visual representation of thought (Visual Thinking) of what they mean or they think that the structure can be visualized in the form of ideas, these ideas can be as numbers, symbols, pictures, diagrams, explanations of models, paintings which can help students in the learning process and resolve their math problems. Presmeg (Surya, 2011) revealed seven role of visual thinking, namely: (1) To understand the problem, to represent the visual problems that students can understand how the elements in a problem related to one another; (2) To simplify the problem, the visualization allows students to identify a simpler version of the problem, solving the problem and then formalize the understanding of the given problem and identify the methods used for similar problems; (3) To see the connection (connection) problem; (4) To understand individual learning styles, each student has their own style when using visual representations when solving problems; (5) In lieu of computing / counting, problem solving can be obtained directly through the visual representation itself, without counting; (6) As a means to examine solutions, visual representations can be used to verify the answers obtained; (7) To transform the problem into mathematical form, can be obtained from the mathematical form of visual representation in problem solving.

Visual Thinking steps according to Bolton (Nurdin, 2012: 29) are: (1) Looking, at this stage, students megidentifikasi problem and reciprocal relationship, an activity to see and collect; (2) Seeing, understanding problems and opportunities, the activity of selecting and grouping; (3) Imagining, generalize steps to find a solution, activity pattern recognition; (4) Showing and Telling, explain what is seen and perceived then communicating.

To make the students' problem solving dibelajarkan better in groups. According Hutagaol (2012: 5) students who learn in small groups over apply problem-solving activities than students who worked individually. Correspondingly, Thorndike (Hutagaol, 2012: 5) concluded that the benefits problem solving in groups, namely: (1) group brings experience more than the experience of each individual; (2) groups give more various suggestions / opinions compared to an individual; (3) a variety of different opinions is more representative than the opinion of one man; (4) in reconciling the differences of opinion will become more real problems; (5) groups are more productive in their criticism of the proposals.

Based on the above opinion, in this study the proposed activity on the Quick Draw. Activity Quick on the draw thick with competitions, where students will have the

opportunity to cooperate. Ginnis (2008: 163-164) states that the activity on the Quick Draw is a research activity to teamwork and speed that can encourage group work. This activity is a race between groups aiming for the first group who can complete a set of questions. The more efficient the work group, the faster the progress of the group. Ginnis (2008: 163) states that the activity of quick on the draw can be done with 9 steps, such as: (1) Prepare a set of questions, such as ten, on the topic being discussed. Make enough copies so that each group has its own (each group has its own set of questions and each question must be carded separately). Each set of questions should be on the card with a different color. Put a set of questions on the teacher's desk, the numbers facing up and the top placed figure number; (2) Divide the class into small groups. Give color to each group so that they can recognize the set of their questions on the teacher's desk; (3) Each student in each group was given material that consists of answers to all the answers, can be a particular page of text books usually. Answers should not be so obvious to the students take the initiative to seek full answer in the text book; (4) In the word "start", a person (first person) from each group goes to the teacher's desk, take the first question according to their color and take her back to the group; (5) The group discussed looking for answers to questions and then answers written on a separate sheet of paper; (6) Upon completion, the answers given to the teacher by the second. Teachers check the answers. If the answers are accurate and complete, the second question from the heap of colors they can be taken. And so on. If no answer is inaccurate or incomplete, the teacher told the students back to the group and try again. Students who write, take questions, and return the answer should alternate; (7) When a student is returning an answer, other students mark the source and familiarize yourself with its contents, so that they can answer the next question with more efficient; (8) The winning group was the first to answer all questions; (9) Teachers with students to answer all questions and student make a written record.

2. Problem Formulation

Based on the background and importance of the issues raised, the issues that were examined in this study were: (1) Is the increase in mathematical problem-solving ability of students who have learning approach Quick Visual Thinking with activity on the Draw better than students who received conventional learning ?; (2) Is the increase in mathematical problem-solving ability of students who have learning approach Quick Visual Thinking with activity on the Draw better than students who received conventional learning when viewed from the beginning of students' mathematical ability (high, medium, and low)?

B. METHODS

This research is a quasi-experimental research design that used non-equivalent control group design (Ruseffendi, 2005: 52). The population in this study is the eighth-grade junior high school students in the city of Pekanbaru the Academic Year 2012-2013. The samples in this study conducted using purposive sampling technique. The

sample used in this study was a class VIII-3 and VIII- 4 in one of the junior high school in the city of Pekanbaru. The instrument used in this study is a test instrument of mathematical problem solving ability.

The sample selection is done based on preliminary information obtained from a mathematic teacher in school that there is a way to take an existing class. As for some of the considerations that may be a reason in the selection of research subjects, namely: (1) Based on the (UN) on the subject of SMP Negeri 25 Pekanbaru math is at a low, so it is very necessary for the provision of learning innovations, one of which is to study the application of different ; (2) Selected class VIII under the assumption that the students have adapted to the learning process in school and not joining the school's program of national exams. Samples were selected in this study were eighth grade students of SMP Negeri 25 Pekanbaru. Based on this sampling technique obtained a sample of two classes of grade VIII-3 as a control class and as many as 41 students of class VIII-4 as the experimental class as many as 40 people.

The instrument used in this study is the ability of a test instrument troubleshooting. Furthermore, data collection techniques using test techniques. Processing and data analysis done by tests of normality and homogeneity. Further testing is then performed using the t test or Man-Whitney nonparametric test. Processing this data using SPSS 17 and Ms. Excel.

C. RESULTS AND DISCUSSION

Discussion of the results of this study based on factors that were observed and found in research.

1. Capacity Based Learning Mathematical Problem Solving

Here's a general overview of the average N-gain mathematical problem solving skills based learning.

Table 1
Mean N-gain Mathematical Problem Solving Ability

Class	Mean N-gain	Clasificasion
Eksperiment	0,45	Medium
Control	0,24	Low

Table 1 above shows that the average N-gain of 0.45 with the experimental class classification is, while the average n-gain control grade of 0.24 with a lower classification. Thus we can conclude that the average N-gain mathematical problem solving abilities experimental class is greater than the average N-gain ability to control a class of mathematical problem solving. This suggests that learning approaches with Visual Thinking on The Quick Draw activities contribute better to the students' mathematical problem solving ability compared with conventional learning.

To prove that the average score of the N-gain students' mathematical problem solving abilities experimental classes are better than the control class differences in the mean test score of the N-gain by using nonparametric tests (Mann-Whitney). Here's a summary of the differences in the mean test score of the N-gain at significant level $\alpha = 0.05$.

Table 2
Data Test Results Mean Difference Score N-gain
Mathematical Problem Solving Ability

Statistik	Value	Discription	Conclusion
Mann-Whitney U	334,000	H ₀ is Rejected	Hipotesis is accepted
Z	-4,598		
Asymp. Sig. (2-tailed)	0,000		
Asymp. Sig. (1-tailed)	0,000		

H0: *Increased mathematical problem solving ability of students who received learning the Visual Thinking approach accompanied Quick on the Draw activity equal to that of students using the conventional learning*

From the results of the Mann-Whitney test on the obtained p-value or Sig. (1-tailed) is $0.000 < \alpha = 0.05$. This shows that H₀ is rejected, it means an increase in mathematical problem-solving ability of students who received learning using learning approach Quick Visual Thinking with activity on the Draw better than students who received conventional learning.

2. Improved Mathematical Problem Solving Ability Based Early Mathematical Ability and Learning

Here's a general overview of the average increase in mathematical problem solving skills based on early mathematical abilities and learning.

Table 3
Mean N-gain Mathematical Problem Solving Ability
Based on Early Mathematical Ability

Ability as measured		PM Mathematical Ability		
Learning Model		PE	PK	Mean
Category KAM	High	0,64	0,42	0,22
	Medium	0,41	0,23	0,18
	Low	0,36	0,11	0,25

Based on Table 3 above obtained information that the category of students who got a low KAM learning approach Quick Visual Thinking with activity on the Draw

obtain a higher increase when compared with students in the high and medium categories KAM. It can be seen from the difference in the average N-gain mathematical problem solving ability of students in each category KAM, KAM category on the difference of 0.22, KAM category is the difference of 0.18 and for the lower category of N-gain is pretty mean difference of 0, 25.

In the group of students who have learning approach Quick Visual Thinking with activity on the Draw and conventional approaches there are differences in the mean increase in mathematical problem solving ability. Groups of students who have learning Visual Thinking with Quick on the Draw activity between high KAM and with there being a difference of 0.23, between the high category with low KAM there is a difference of 0.28, and the category of moderately low KAM there is a difference of 0, 05.

While the group of students who received conventional teaching approach, the category of high KAM is there is a difference of 0.19, between the high category with low KAM there is a difference of 0.31, and the category of moderately low KAM there is a difference of 0.12. This fact indicates that the higher KAM students have the higher problem solving abilities gained. This indicates that there is a relationship between KAM owned by students with mathematical problem solving ability.

To determine whether there are differences in the increase in mathematical problem solving ability of students who have learning approach Quick Visual Thinking with activity on the Draw (experimental class) and students who have learning with the conventional approach (control group) in terms of early mathematics ability (high, medium, and low), necessary to test differences in the mean score of the N-gain. Here's a summary of the differences in the mean test score of the N-gain at significance level $\alpha = 0.05$.

Table 4
Data Test Results Mean Difference Score N-gain
Mathematical Problem Solving Ability
Based on Early Mathematical Ability and Learning

KAM	Learning	Comparison of Mean	Sig.	Conclusion
High	PVT : PK	0,64 : 0,42	0,159	H ₀ Accepted
Medium	PVT : PK	0,41 : 0,23	0,004	H ₀ Rejected
Low	PVT : PK	0,36 : 0,11	0,000	H ₀ Rejected

H₀: Increased mathematical problem solving ability of students who have learning approach Visual Thinking with Quick on the Draw activity similar to teaching students who have conventionally, when viewed from the beginning of students' mathematical ability (high, medium, and low)

Based on Table 4 above it can be concluded that the category of early mathematics ability of students high category increase in mathematical problem-solving ability of students who have learning approach Quick Visual Thinking with activity on the Draw together with students who received conventional learning. As for the category of medium and low increase in mathematical problem-solving ability of students who have learning approach Visual Thinking with Quick on the Draw activity better than students who received conventional learning. For low category increase students' mathematical problem solving ability that gets learning approach Quick Visual Thinking with activity on the Draw better than students who received conventional learning.

D. CONCLUSION AND RECOMMENDATIONS

Based on the results of data processing, analysis, and discussion of the findings is concluded as follows: (1) Overall implementation of the Visual Thinking approach of learning activity accompanied Quick on the Draw can enhance the problem solving and mathematical communication students; (2) Improvement of mathematical problem solving ability of students whose learning by using the Visual Thinking approach to learning with Quick on the Draw activity is significantly better than students whose learning with conventional learning approach; (3) Increase in mathematical problem-solving ability of students who have learning approach Visual Thinking with Quick on the Draw activity significantly as compared to students who are learning using conventional teaching approach, when viewed from the category of early mathematical ability of high student; (4) Increase in mathematical problem-solving ability of students who have learning approach Visual Thinking with Quick on the Draw activity is significantly better than the students who are learning using conventional teaching approach, when viewed from the category of early mathematical ability of students being; (5) Increase in mathematical problem-solving ability of students who have learning approach Visual Thinking with Quick on the Draw activity is significantly better than the students who are learning using conventional teaching approach, when viewed from the category of early mathematical ability of students is low; The conclusion has been stated above, provide recommendations following recommendations: (1) learning approach Quick Visual Thinking with activity on the Draw should be an alternative approach to learning for junior high school teachers in particular to improve the ability of problem solving and mathematical communication students; (2) It should be conducted outreach to teachers about the importance of communication and problem solving skills in mathematical learning and development; (3) If a teacher wants to implement approach to learning Visual Thinking with Quick on the Draw activity, the teacher should take into account any activities to be conducted so that sufficient time is available to implement the learning approach; (4) Application of

Visual Thinking accompanied learning approach Quick on the Draw activity in the classroom, should be accompanied with more exercises that can improve the varying mathematical abilities of students; (5) For further research, this study can be renovated to include other learning activities in the implementation of the Visual Thinking approach to learning; (6) For further research, this study can be continued by applying the Visual Thinking approach of learning activity accompanied Quick on the Draw for other mathematical abilities, such as critical thinking skills and creative thinking; (7) For further research, if the research continues to include (KAM) students, then it should be so arranged matters that can interpret students' actual knowledge; (8) For further research, if you want to apply the Visual Thinking approach of learning activity accompanied Quick on the Draw, you should choose a suitable material, because not all material is suitable to be submitted with this learning approach.

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